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MEMORANDUM AND RECOMMENDATION

OF THE

PRESIDENT OF THE

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

TO THE

EXECUTIVE DIRECTORS

ON A

PROPOSED LOAN

IN AN AMOUNT EQUIVALENT TO US$31.6 MILLION

TO THE

REPUBLIC OF KOREA

FOR A

SECOND TECHNOLOGY ADVANCEMENT PROJECT

APRIL 24, 1990

CURRENCY EQUIIVALENTS
(March 1990)

Currency Unit - Korean Won (W)
US$1.00 - W 692

WEIGHTS AND MEASURES

Metric System

FISCAL YEAR

January 1 - December 31

ACADEMIC YEAR

March - February

ABBREVIATIONS

ICB	-	International Competitive Bidding
GEC	-	Genetic Engineering Center
KAIST	-	Korea Advanced Institute of Science and Technology
KIER	-	Korea Institute of Energy and Resources
KSRI	-	Korea Standards Research Institute
LCB	-	Local Competitive Bidding
MOST	-	Ministry of Science and Technology
O&M	-	Operation and Maintenance
OSROK	-	Office of Supply, Republic of Korea
R&D	-	Research and Development
SMI	-	Small and Medium Industry

KOREA

SECOND TECHNOLOGY ADVANCEMENT PROJECT

Loan and Project Summary

Borrower:	Republic of Korea
Beneficiaries:	Korea Advanced Institute of Science and Technology Genetic Engineering Center Korea Standards Research Institute Korea Institute of Energy and Resources
Amount:	US$31.6 million equivalent
Terms:	Repayable in 15 years including 5 years of grace at the Bank's standard variable interest rate
On-lending Rate:	Not applicable

Financing Plan:		
	Government	US$14.2 million
	IBRD	US$31.6 million
	Total	US$45.8 million

Economic Rate of Return:	Not applicable
Staff Appraisal Report:	Report No. 8204-KO
Map:	IBRD No. 22116

MEMORANDUM AND RECOMMENDATION OF THE PRESIDENT
OF THE INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT
TO THE EXECUTIVE DIRECTORS
ON A PROPOSED LOAN TO
THE REPUBLIC OF KOREA
FOR A SECOND TECHNOLOGY ADVANCEMENT PROJECT

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1. The following memorandum and recommendation on a proposed loan to the Republic of Korea for US$31.6 million equivalent is submitted for approval. The proposed Loan would be repayable in 15 years including 5 years of grace at the Bank's standard variable interest rate and would help finance a technology advancement project.

2. Background. In the 1980s, technology development in Korea has been moving from a stage characterized by the local assimilation of imported technology to one which is emphasizing increasingly the pursuit of indigenous technological innovation. In the previous two decades of assimilating imported technology, Korea concentrated on mastering production technologies and the need for technological innovation was modest. However, if Korea is to continue its industrial development towards technologically sophisticated, higher value-added output and remain competitive in export markets, a strong commitment must be made to ensuring that the country's R&D system can respond to the increasing demand for more advanced technological development. This system consists of three major parts: the ten national research institutes which focus on basic and applied research, the universities which are oriented towards basic research and the private sector research institutes which focus on applied and developmental research. Reinforcing the need to pursue advanced technology is the growing reluctance of the leading industrial countries to continue exporting advanced technology to Korea, which has become an increasingly successful competitor.

3. The Government aims to achieve, by around 2000, a level of technology comparable to the present level of the advanced countries. A long term technology development plan sets out the major goals to be achieved and the key technological fields to be developed in order to meet these goals. The plan has two major objectives. First, to expand the supply of high-level R&D personnel from the level of 13 per 10,000 population in 1986 to 30 per 10,000 by 2001. To achieve this goal, Korea would need to employ about 150,000 scientists and engineers by 2001 compared with 52,000 in employment in 1986. In response to this need, a rapid expansion of enrollments in science and engineering programs has been undertaken in recent years. Within the universities even greater emphasis has been placed on graduate programs and the results are now being seen in the rapid growth of outputs with graduate degrees in science and engineering--almost 2.4 times between 1982 and 1988. Given this rate of expansion, it is certain that the overall objective for the employment of R&D personnel will be achieved by 2001. Second, R&D investment is planned to increase from 2% of GNP in 1986 to 5% by 2001 with the private sector being responsible for the major R&D effort. A massive increase in overall R&D expenditure has been achieved (nearly nine-fold in 1980-87) largely driven by the private sector's response to generous tax and other financial incentives to invest in R&D. Consequently, the private sector now accounts for nearly 80% of total R&D expenditure.

4. Rationale for Bank Involvement. The Bank has been assisting the development of technology in Korea over the past decade in a series of operations. The Bank has provided support to the small and medium industry (SMI) sector and substantial assistance in financing R&D projects through various financial intermediaries; strengthening the institutional capacity of these intermediaries has also been pursued. Major assistance has been provided for the development of technical and scientific education. Underlying these operations has been a continuous dialogue between the Bank and Government which has had an important influence on the country's industrial development. The Bank's operations have been consistent with the Government's priorities and evaluation reports indicate that their objectives have generally been met successfully.

5. The policy environment in which the proposed project is being designed is generally sound, having developed over the last decade with the Bank's assistance under two sector loans which supported improvements in the policy framework governing education and research in science and technology. At this stage in Korea's development, the Bank is again pursuing project lending as a means of assisting the Government in filling gaps in the investment program required to upgrade the research capacity of the national institutes and in selected centers of excellence in science and engineering education. The First Technology Advancement Project, approved in April 1989, is assisting two national R&D institutions to improve their capacity to provide advice and technical services to SMIs through strengthening basic R&D activities and quality testing for their products. It is also assisting in improving the quality of science and engineering education at the Korea Institute of Technology. The proposed project would continue to address the needs of similar institutions which the Government has identified as requiring additional quality-improving investments and which the Bank is well-qualified to provide. The project would continue the opportunity for the Bank to learn lessons from Korea's experience in technology development which could be utilized elsewhere.

6. Project Objectives. The broad objective of the project is to reinforce the Government's priority for technology-intensive industrial development by strengthening basic R&D capacity and enhancing the application of industrial standards to raise the quality of products. The project aims to: (a) improve the quality of research programs and the graduate education in science and engineering associated with them at the Korea Advanced Institute of Science and Technology (KAIST); (b) enhance the R&D capacity of the Genetic Engineering Center (GEC) and the quality of its support to the bio-technology industry; (c) improve the ability of the Korea Institute of Energy and Resources (KIER) to undertake basic R&D in support of industry in the energy and resources fields and strengthen its energy survey capacity; and (d) enhance the development of national standards to ensure the quality of industrial products especially in the export sectors through strengthening the R&D capacity of the Korea Standards Research Institute (KSRI).

7. Project Description. The major component of the project would be equipment to be financed by the Bank amounting to about 69% of total project costs. The Government would finance complementary inputs namely civil works to house some of the equipment (6%); and installation costs, O&M and

consumables related to the equipment (10%); and all contingencies (15%). The proposed Bank loan, to be disbursed over a period of four years, would finance items of advanced equipment (baseline cost, US$31.6 million) for four national institutions which play important roles in Korea's industrial/technological development. The loan would finance about 83% of the estimated foreign exchange cost of the project or about 69% of total project costs. Project implementation would be the responsibility of each project institution with the Ministry of Science and Technology (MOST) playing an overall coordinating role. Equipment procurement would be undertaken by the Office of Supply, Republic of Korea (OSROK) in conjunction with the project institutions. About 85% of the value of equipment would be procured under ICB. A breakdown of costs and the financing plan is shown in Schedule A. Amounts and methods of procurement and of disbursements, and the disbursement schedule are shown in Schedule B. A timetable of key project processing events and the status of Bank Group operations in Korea are given in Schedules C and D respectively. A map is also attached. The Staff Appraisal Report, No. 8204-KO dated April 23, 1990, is being distributed separately.

8. Agreed Actions. The Government has agreed that semi-annual progress reports from each project institution would be submitted to the Bank around March and September and status reports provided to visiting missions.

9. Benefits. The project would strengthen industrial R&D and raise the quality of training of high-level R&D personnel. It would also improve the quality of the Government's advice and technical services to the energy and resources industries, thereby contributing to a more effective exploitation of energy and natural resources. The project would result in the application of more rigorous standards to the quality of industrial products thereby making them more competitive in domestic and export markets.

10. Risks. There are no major risks associated with the proposed project.

11. Recommendation. I am satisfied that the proposed loan would comply with the Articles of Agreement of the Bank and recommend that the Executive Directors approve the proposed loan.

Barber B. Conable
President

Attachments
Washington, D.C.
April 24, 1990

KOREA

SECOND TECHNOLOGY ADVANCMENT PROJECT

Estimated Costs and Financing Plan

Estimated Costs 1/

	Local	Foreign	Total
	(US$ million)		
Korea Advanced Institute of Science Technology	1.1	12.1	13.2
Genetic Engineering Center	1.4	4.3	5.7
Korea Standards Research Institute	3.1	6.5	9.6
Korea Institute of Energy and Resources	0.9	9.7	10.6
Baseline cost	6.5	32.6	39.1
Contingencies			
Physical	0.6	3.3	3.9
Price increase	0.5	2.3	2.8
Subtotal	1.1	5.6	6.7
Total project cost	7.6	38.2	45.8
Financing Plan:			
Government	7.6	6.6	14.2
IBRD	-	31.6	31.6
Total	7.6	38.2	45.8

1/ Does not include duties, taxes and fees estimated at US$2.6 million

KOREA

SECOND TECHNOLOGY ADVANCEMENT PROJECT

Procurement Method and Disbursements
(US$ million, including contingencies)

Category of Expenditure	Procurement Method /a				Total Cost
	ICB	LCB	Other /b	N/A	
Equipment	31.0 (31.0)	-	6.0 (0.6)	-	37.0 (31.6)
Equipment transportation and installation	-	-	-	2.2 (0.0)	2.2 (0.0)
Civil works	-	3.3 (0.0)	-	-	3.3 (0.0)
Operation and maintenance	-	-	-	1.4 (0.0)	1.4 (0.0)
Consumable materials	-	-	-	1.9 (0.0)	1.9 (0.0)
Total	31.0 (31.0)	3.3 (0.0)	6.0 (0.6)	5.5 (0.0)	45.8 (31.6)

Disbursements

Category	Amount	% of expenditures to be financed
Equipment		100% of foreign expenditures for imported equipment or the ex-factory cost of locally manufactured equipment; 65% of the cost of local expenditures on other equipment procured locally.
KAIST	12.0	
GEC	4.0	
KSRI	6.0	
KIER	9.6	
Total	31.6	

Estimated IBRD Disbursements

Bank FY	1991	1992	1993	1994
Annual	6.2	14.3	8.1	3.0
Cumulative	6.2	20.5	28.6	31.6

/a Figures in parentheses are the amounts to be financed by the loan.
/b Includes international and local shopping.

KOREA

SECOND TECHNOLOGY ADVANCEMENT PROJECT

Timetable of Key Project Processing Events

(a)	Time taken to prepare:	7 months
(b)	Prepared by:	Government
(c)	First IBRD mission:	March 1989
(d)	Appraisal mission departure·	October 29, 1989
(e)	Negotiations:	March 1990
(f)	Planned date of effectiveness:	August 1990
(g)	List of relevant PCRs and PPARs	First Education Project (Cr. 151-KO), PPAR No. 1801, November 22, 1977. Second Education Project (Ln. 906.CR 394-KO), PPAR No. 4509, May 24, 1983. Third Education Project (Ln. 1096-KO), PPAR No. 4544, June 14, 1983. Fourth Education Project (Ln. 1474-KO), PCR NO. 5516, March 8, 1985. Sector Program on Higher Technical Education (Ln. 1800-KO), PPAR No. 7252, May 24, 1988. Electronics Technology Project (Ln. 1676-KO), PCR, October 21, 1988

THE STATUS OF BANK GROUP OPERATIONS IN THE REPUBLIC OF KOREA

A. Statement of Bank Loans and IDA Credits /a
(As of March 31, 1990)

Loan or Credit Number	Fiscal Year	Borrower	Purpose	Amount ($ million) (less cancellations) Bank	IDA	Undisbursed
Seventy-eight loans and nine credits fully disbursed				5,216.70	116.59	-
2388	1984	Republic of Korea	Joonju Regional Development	40.68		1.86
2392	1984	Republic of Korea	Highway Sector	216.42		1.41
2491	1985	Republic of Korea	Water Supply	90.00		1.73
2514	1985	SMG	Urban Transportation	28.76		9.66
2571	1985	Republic of Korea	Second Industrial Finance	188.12		4.78
2600	1986	Republic of Korea	Seoul-Busan Corridor	34.60		6.86
2615	1986	Republic of Korea	Fourth Water Supply	34.13		0.12
2704	1986	KLDC	Urban Land Development	150.00		8.00
2726	1986	Republic of Korea	Pusan Port	134.50		39.93
2905	1988	Republic of Korea	Kyonggi Regional Transport	116.00		72.41
2908	1988	Taegu City Government	Taegu Urban Transport	30.00		26.01
2913	1988	Korea Technology Corp.	Third Technology Development	50.00		11.95
3037	1989	Republic of Korea	Technology Advancement	16.40		1.80
3061	1989	Republic of Korea	Road Improvement	200.00		200.00
3178	1990	Republic of Korea	Juam Water Supply	34.00		34.00
	Total			6,575.31	116.59	433.32
	of which has been repaid			3,473.07	16.79	
	Total now held by Bank and IDA			3,102.24	99.79	
	Amount sold		131.51			
	of which repaid		83.56			
	Total undisbursed			433.32	-	433.32

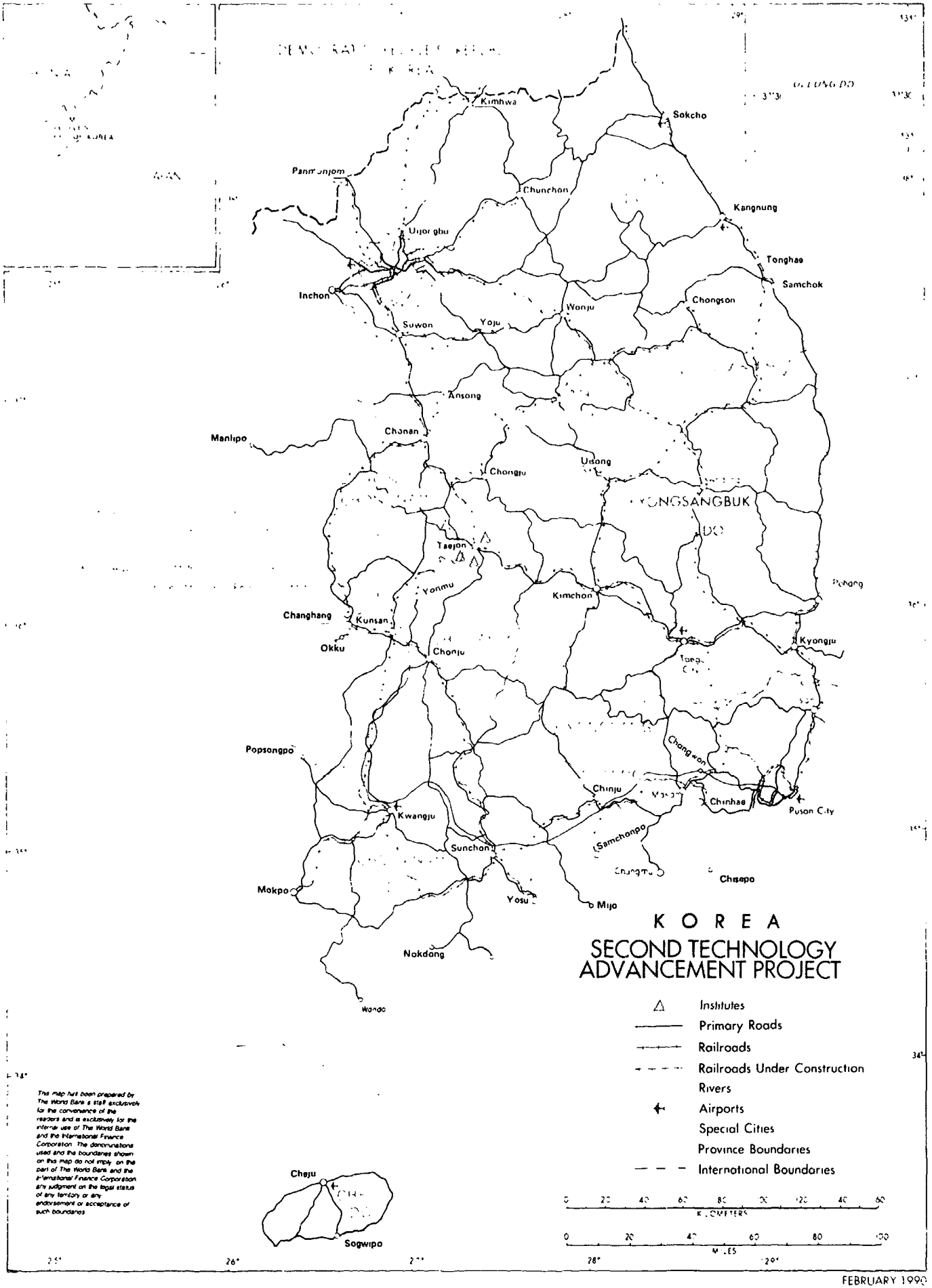
/a The status of the projects listed in Part A are described in a separate report on all Bank/IDA-financed projects in execution, which is updated twice yearly and circulated to the Executive Directors on April 30 and October 31.

B. Statement of IFC Investments
(As of March 31, 1990)

Fiscal Year	Obligor	Type of Business	Loan	Equity	Total
			--- (US$million) --		
1968	KLB (KDFC)	Development Financing	-	0.7	0.7
1969	Honam Silk Co.	Textiles	1.4	0.3	1.7
1970	Atlas Paper	Pulp and paper	4.5	0.5	5.0/a
1971	Korea Investment Finance Corp.	Capital Market Development	-	0.7	0.7
1974	KLB (KDFC)	Development Financing	-	0.4	0.4
1974	Korea Investment Finance Corp.	Capital Market Development	-	0.3	0.3
1975	Gold Star & Co. Ltd.	Electronic Products	16.0	1.3	17.3
1975	Korea Securities Finance Corp.	Capital Market Development	5.0	0.6	5.6
1975	Tong Yang Nylon Company, Ltd.	Synthetic Fibers	6.9	5.1	12 0
1975	Hae Un Dae Dev. Co. Ltd. (Busan)	Tourism	2.8	1.2	4.0
1976	Korea Investment Finance Corp.	Capital Market Development	-	0.4	0.4
1976/ 84/87	Chonju Paper Mfg. Co.	Paper	5.0	1.0	6.0
1976/86	Korea Zinc. Co. Ltd.	Zinc	21.0	5.6	26.6
1976	KLB (KDFC)	Development Financing	17.8	-	17.8
1976	Gold Star & Co. Ltd.	Electronic Products	10.0	0.4	10.4
1977	Gold Star & Co. Ltd.	Electronic Products	-	0.2	0.2
1977	KLB (KDFC)	Development Financing	-	0.3	0.3
1977	Korea Securities Finance Corp.	Capital Market	-	0.5	0.5
1977	Korea Development Leasing Corp.	Capital Market	15.0	0.4	15.4
1978	KLB (KDFC)	Development Financing	-	1.1	1.1
1979	Gold Star & Co. Ltd.	Electronic Products	-	1.7	1.7
1979	KIFC	Capital Market	-	0.6	0.6
1979	Korea Development Leasing Corp.		-	1.4	1.4
1979	Gold Star & Co. Ltd.	Electronic Products	-	1.5	1.5
1980/84 85/87/ 88/89	Gold Star & Co. Ltd.	Electronic Products	-	18.4	18.4
1980	Korea Investment Finance Corp.	Capital Market	-	0.6	0.6
1980/ 82/84	Korea Securities Finance Corp.	Capital Market	-	2.3	2.3
1980	KLB (KDFC)	Development Financing	-	21.1	21.1
1981	Taihan Bulk Terminal	Grain Port Terminal	7.0	2.5	9.5
1982/85/ 89	KIFC	Capital Market	-	5.9	5.9
1982	K-TAC (Korea Tech. Advancement Corp.)	Research & Development	-	0.6	0.6
1983/85	KDIC	Money & Capital Market	-	5.9	5.9
1984	Halla Cement	Cement Const. Material	4.3	3.9	8.2
1985/86	Korea Fund	Money & Capital Market	-	12.8	12.8
1987	Korea Business & Research Information	Money and Capital Market	-	0.1	0.1
1988	ANAN	General Manufacturing	-	15.8	15.8
1989	Oriental	Chemicals & Petrochemicals	-	15.2	15.2
	Total Gross Commitments		116.7	131.3	248.0
	Less Cancellations, Terminations, Repayments and Sales		112.0	48.0	160.0
	Total Commitment Now Held by IFC		4.7	83.3	88.0
	Total undisbursed (including participant's portion)		-	2.7	2.7

/a Cancelled at the request of the Company.

IBRD 22116



KOREA
SECOND TECHNOLOGY ADVANCEMENT PROJECT

- △ Institutes
- Primary Roads
- Railroads
- Railroads Under Construction
- Rivers
- Airports
- Special Cities
- Province Boundaries
- International Boundaries

KILOMETERS 0 20 40 60 80 100 120 140 160

MILES 0 20 40 60 80 100

FEBRUARY 1990